NATURAL RESOURCES CONSERVATION SERVICE

CRITICAL AREA PLANTING DESIGN PROCEDURES

(342DP)

CONTENTS

A. Stabilizing Critical Areas by Seeding Perennial Vegetation (Refer to Pasture Planting (512) and Range Planting (550) for additional guidance on planting methods and adapted species)

1. **Grading Shaping and Filling**

   a. Necessary grading, shaping and smoothing shall be made before seedbed preparations are started and to the degree necessary to establish cover and permit the intended use of the area. Slopes on dunes and blowouts will not exceed three horizontal to one vertical. For practices such as dams, grassed waterways, diversions, terraces or other structural practices grading and shaping shall be completed according to the appropriate practice standard(s).

   b. On steep banks, earth moving machinery should be used to shape the area in a manner that seedbed preparation and seeding operations can be carried out and permit the use of conventional equipment for seedbed preparation (Cabling of equipment may be necessary on slopes steeper than three horizontal to one vertical).

2. **Seedbeds/Cover Crops.** Critical areas are usually low in fertility and present difficult problems in establishing permanent cover. Provide protective soil surface cover using the most appropriate of the following methods:

   a. Tilled seedbed with mulch – Provide a firm seedbed, then prepare the surface to at least a 2-inch depth. This is necessary to permit anchoring of the mulch. Plant the grass seed and immediately apply and anchor a mulch cover. Preferred mulching material is native hay. It must be relatively free of weeds and certified noxious weed free mulch. Specifications for kinds, amounts, and anchoring methods are listed under the Mulching (484) practice standard.

   b. Cover Crops (used to provide cover and suitable seed bed prior to planting grass, cover crops selected must be compatible with grass seeding)

      (1) Prepare a suitable seedbed and plant a cover crop the season prior to planting grass. Refer to Cover Crop (340) practice standard for cover crops that are compatible with planned grass cover. When small grain such as rye and wheat are used as a cover crop, it must be killed

while in a vegetative state (prior to making a seed head) with a non-selective herbicide to avoid allopathic effects from mature straw.

(2) Manage the cover crop so that a stubble height of 8 to 18 inches is available for the grass planting and so viable seed is not produced. Seed the permanent grass mixture into the stubble of the cover crop without tillage (make sure that planting equipment can properly place grass seed into existing cover).

(3) Refer to the Cover Crop (340) practice standard for the time of year, kind of cover, and rate of planting.

c. Companion cover crops Oats or other appropriate companion crops can be sown along with grass seed to provide a quick cover for erosion control. Winter annual companion cover crops such as rye and wheat will only be planted in the early summer and spring. Companion cover crops are best suited for cool season grass seedings and in areas of the state with higher rainfall. Refer to standard Cover Crop (340) for requirements and compatibility with planned grass cover.

3. **Grass/Perennial Vegetation Seeding**

a. Method/depth of seeding

(1) Grass drill – This is the recommended method, grass drills should be equipped with double-disk openers, depth bands, press wheels or drag chains, and seed boxes with separate boxes or dividers for each seed tube that will handle both chaffy and free-flowing seeds. If possible, operate grass drill across slopes.

(2) Broadcast seeding - On areas too steep for equipment operation, seed mixtures may be broadcast along with a companion crop. Double the rate of seeding. Cover seed by dragging a harrow and then pack with a roller to provide good soil-seed contact whenever possible. Broadcast seedings should be done as soon as possible after shaping (prior to the ground sealing).

(3) Hydroseeding – Seed shall be applied separately from mulch and fertilizer and be applied prior to mulch and fertilizer. When appropriate mulch can be applied with this method by itself or in combination with fertilizer immediately after seed has been applied. Limit the application of mulch to 150 pounds of solids per 100 gallons of water. Double the rate of seeding. When lime and fertilizer are applied without mulch it shall be applied prior to hydroseeding grass seed.

(4) Other types of seeders such as; grass drills, interseeders, mechanical power drawn drills, hydraulic seeders, etc. can be utilized but must be compatable with type of seed being planted and must be able to penetrate the soil surface and plant the seed at a depth of not less than ¼" and not more than 1". Depths of ¼" to ½ " are recommended on heavy soils and ½" to 1" on sandy soils.

b. Seeding dates:

(1) Cool-season dominant mixtures— November 15 – May 1 (Statewide), or Aug.15 – September 15 Vegetative Zones I and II)- Aug. 1 – September 30 (Vegetative Zones III and IV).

(2) Warm-season dominant mixtures ---November 1 - June 15 (optimum date March 1- May 15).

(3) When it is not practical to seed a cover crop and/or wait until seeding dates recommended above, seeding may be completed as soon as construction work is complete. In these cases an appropriate companion crop according to standard Cover Crop (340) and/or mulch according to standard Mulching (484) will be utilized in conjunction with the seeding.

c. Seeding Rates

(1) When drilled mixtures will provide a minimum of 60 P.L.S. seeds per square foot of grass. Forbs added to the mixture will be above and beyond grass seeding rates.

(2) Double the grass seeding rate when broadcasting or hydroseeding.

d. Mixtures/Seed Quality

(1) Mixtures will contain at least 60% sod-forming grass species and will contain a minimum of two grass species (refer to Section II Pasture and Hayland Suitability Groups, Pure Live Seed Calculations, Table 2 for a complete list of species).

(2) Grass seed must meet the distance (mileage) requirements for non-certified seed and variety restrictions in accordance with Section II Pastureland and Hayland Interpretations "Grass and Forb Seed Source Requirements" and "Certified Perennial Grass Varieties Recommended for Nebraska" Extension publication EC90-120. Forb species and seed must be adapted to the site as shown in Section II Rangeland Interpretations, or Pastureland and Hayland Interpretations (Table 2).

(3) Certified varieties that are best suited to meet client objectives are recommended. If certified varieties of perennial grasses are not available, it is permissible to use non-certified seed originating from the same general locality of the planting site according to grass and forb seed requirements in Section II-Pastureland and Hayland Interpretations.

(4) Grass and forb species must be adapted to the site as shown in Pasture Planting (512), Range Seeding (550) and/or Section II-Range Interpretations and Pastureland and Hayland interpretations.

(5) It is unlawful for any person to sell, offer for sale, expose for sale, or transport for sale any agricultural seed within Nebraska, unless the test to determine the percentage of germination required shall have been completed within a 12 month period or 6 months between states, exclusive of the calendar month in which the test was completed.

(6) A copy of current analysis of germination and purity must be furnished regardless of who grows or sells the seed.

(7) Species selected will be compatible with the planned use of the area and maintenance measures such as mowing frequency/height, and planned herbicide use on-site and/or adjacent sites. Management measures and herbicides that will be utilized shall be discussed with the landowner prior to recommending grass and forb species. For example, sites that are mowed several times a year are best suited to a low growing mixture such as Buffalograss and Blue grama, and mid/tall warm season grasses are not suited when a site is mowed late in the season year after year.

(8) Table 1 can also be used to select appropriate species for various uses.

5. **Fertilizing/Liming**

a. On sites with at least 2 inches of topsoil no fertilizer should be used in the establishment year.

b. Soil pH will be amended as needed to establish and maintain the specific grass and forb species being planted. Soil pH and phosphorus levels are especially critical when legumes are included in the grass mixture.

c. Where native species are planted do not apply nitrogen fertilizer in the establishment year. Fertilizer can be applied one year after the seeding date per guidance below. Introduced cool-season grass seedings should follow the guidance below in the establishment year.

(1) On sites that are low in fertility (cut slopes with little or no surface soil), use 10 to 30 pounds each of nitrogen and phosphorous per acre in Major Land Resource Areas (MLRAs) 60A, 63B, 64, 65, 66, 67, and 72 (refer to FOTG, Section I, Maps, for the current MLRA map of Nebraska).

(2) On sites that are low in fertility use 30 to 60 pounds each of nitrogen and phosphorous per acre in MLRAs 71, 73, 75, 102C, 106, and 107 (refer to FOTG, Section I, Maps, for the current MLRA map of Nebraska). On medium-textured soils, the addition of 5 to 10 pounds of zinc may be needed to speed up the vegetative growth. On sandy soils 5 to 10 pounds of sulfur may be needed to speed up vegetative growth.

(3) On low fertility sites a cover crop or mulching should be recommended whenever possible. Fertilizer should be applied before cover crop planting

(4) Fertilizer should be applied in subsequent years to maintain a healthy stand of grasses per soil test results and according to standard Nutrient Management (590).

6. **Weed/Pest Control For Establishment**

a. If excessive competition, especially from annual grasses are/will be present, pre-emergent herbicides or a cover crop shall be recommended. Control of grassy weeds the first year will greatly enhance the success of the seeding.

b. Post emergent herbicides can be recommended when necessary, especially for broadleaf weeds. Care should be taken to ensure that grass seedlings are at the correct stage and weeds are not too mature and are at the right stage to control. Broadleaf weeds generally should be sprayed when 4 to 6 inches high if they are thick enough to shade the ground completely. The height of mowing or shredding must be such that more leaves are cut from weed plants than from seeded grasses or legumes.

c. Refer to the current Guide for Weed Management in Nebraska for recommended products, rates and timing. Follow all label instructions.

d. When possible clipping/mowing can be substituted for herbicides for controlling broadleaf weeds. Mowing should be completed in June and early July will be discontinued in late July. The height of mowing or shredding must be such that more leaves are cut from weed plants than from seeded grasses or legumes.

e. Severe infestations of grasshoppers may be necessary until plants are well-established.

7. **Irrigation**

a. When an irrigation system is available it should be utilized to enhance establishment (especially in droughty periods or when quick establishment is needed).

b. Application of water will be light, frequent and at a rate that no erosion occurs until plants are established.

8. **Mulching**

a. Grass seeding will be completed prior to mulching.

b. Refer to Nebraska Technical Guide Section IV, MULCHING (484) for specifications including anchoring requirements.

c. Mulching is not required on critical areas where an adequate cover crop can be grown to provide for erosion control and site establishment.

d. Mulches are necessary on south-facing and west-facing cut slopes, dunes or blowouts and on saline or alkaline areas. This will include denuded cut slopes 4:1 or steeper and 10 feet or more in height, or longer than 20 feet. Mulches will be anchored after vegetation is planted.

e. Mulching is recommend on other areas that will be especially difficult to establish vegetation on or are at high risk for wind and water erosion damage.

9. **Maintenance and Protection of Seeded Critical Areas**

a. Critical areas need to be established as quickly as possible in order to have the maximum amount of protective vegetative cover as soon as possible to prevent erosion.

b. Seedings shall be protected from grazing until the stand is fully established.

c. Permanent livestock exclusion is most desirable and will offer good cover for many types of wildlife.

d. When grazing is allowed it shall be limited to the extent necessary to maintain/improve the vegetative cover and shall not jeopardize the purpose(s) of the critical area planting. Fences will need to be installed to regulate grazing and to prevent trailing or other damage from livestock.

B. Stabilizing Critical Areas with Sod, Sprigs or Cuttings (for shaping, fertilizing, irrigation, maintenance, protection and other additional specifics refer to Section A "Stabilizing Critical Areas by Seeding Perennial Vegetation".

1. **Plant materials**

a. Obtain seedlings, plants, crowns, or sod plugs that are healthy and have received proper care in lifting from the nursery and during transport to the planting site.

b. Plant material should never be allowed to become dry or overheated due to improper packing and hauling. Keep plant materials moist and as cool as possible after delivery to the site until they are set.

2. **Site Preparation**

a. The surface to be sodded or sprigged shall be reasonably smooth, even, and free from debris. The surface shall be brought to the correct alignment, grade, and cross section.

b. Refer to Section A "Stabilizing Critical Areas by Seeding Perennial Vegetation" for more information on grading, shaping and filling.

3. **Sodding/Sprigging**

a. The sod should be in strips or blocks of a native grass mixture, Switchgrass, Prairie cordgrass, Reed canarygrass, or other suitable grasses (avoid using Reed canarygrass where it may invade and be undesirable). Bluegrass sod is used only when the area is irrigated. Sod materials are to be taken from good, solid, thick-growing stands.

b. Sod shall be cut in strips of uniform width and to a uniform thickness of at least 3 inches for tall grass and ½ to 1-½ inches for short grasses. Lay sod within 24 hours from the time it is cut.

c. Sod strips shall be carefully placed in rows across (perpendicular or at right angles to) the direction of slope. The sod strips shall be placed together tightly so that no open joints are left between strips or between the ends of strips. Joints between the end of strips shall be staggered. Any spaces between joints shall be filled with topsoil and all edges of sod covered with topsoil at least 2 inches in depth. The edge of the sod at the top of slopes shall be turned slightly under and

a layer of the soil compacted over the edge so as to conduct surface water over and onto the top of the sod. The sod shall be well tamped to help it remain firmly in place.

d. On slopes steeper than three horizontal to one vertical or where high velocity flows are likely to occur over newly sodded areas, the strips should be held in place by wooden pegs or anchored with jute netting or other commercial netting over the sod (refer to 484 Mulching standard).

e. Sprigs/Cuttings on wet sites

(1) Prairie cordgrass or Reed canarygrass sprigs or cuttings will be planted at 1-foot intervals along the water edge for shorelines, in front of impoundment structures, areas that are subject wave action, edge of concrete or metal structures, or on any site where there is danger from rodent damage. This will include the areas in front of the weirs and along the side of the wingwalls of concrete and sheet-metal weir structures. Sprigs will be planted in the strip from 6 to 12-inches from the structure. Reed canarygrass should be avoided where it has the potential to spread into areas where it is not desired.

(2) Parallel strips of Prairie cordgrass or Reed canarygrass may be placed across spillways, flumes, waterways, roadside ditches, areas that are subject to concentrated flow erosion, or other appropriate areas.

(3) Sprigs/cuttings should be at least 6-inches long, consist of a growing point, and should be at least 3-inches deep at 1-foot intervals. Sprigs should not be permitted to dry out and should not be exposed to direct sunlight. Plant sprigs within 24 hours of the time they are dug.

f. Sprigging or Sodding Dates

(1) Cool-season vegetation:

- August 1 to October 10 (optimum August 1 to September 15)
- March 1 to May 30 (optimum March 1 to May 1),

(2) Warm-season vegetation:

- March 1 to May 31 (optimum March 1 to May 20),

C. Stabilizing Critical Areas by Planting Shrubs and Trees

1. **Tree Planting Requirements/Procedures**

a. For overall guidance on designing tree/shrub plantings for Critical Areas refer to Tree Planting (612) practice standard and Tree Planting Design Procedures (612 DP).

b. Species selected must establish quickly, spread and hold soil in place. Shrubs and deciduous trees that sucker from the root or otherwise spread in order to provide effective vegetative cover should be favored (Refer to Section II Windbreak Interpretations, Conservation Tree/Shrub groups Table 11 Species Attributes).

c. Refer to Tree Planting Procedures TPP 380 for detailed planting, site preparation, care and maintenance guidelines, control of competitive vegetation, care and maintenance procedures and all other tree planting procedures.

2. **Protection of Planting**

a. Livestock will be excluded from planting. Fencing will be installed when necessary.

b. The planting will be protected from fire, rodents and other damaging activity.

D. Stabilizing Dunes and Blowouts With Management Methods (refer to Section A "Stabilizing Critical Areas by Seeding Perennial Vegetation" for requirements when shaping and seeding to grass)

1. **Natural recovery by protection and through use of Prescribed Grazing (528A) standard**
   a. This method is effective where desirable native grass species are present in sufficient amounts and the character of the blowout will permit stabilization in the desired time.
   b. Limited livestock traffic (hoof action) especially during the dormant season may be desirable, but do not permit overuse or destruction of vegetative cover.
   c. Temporary fencing can be utilized to manage grazing on critical areas as needed.
   d. Refer to Prescribed Grazing (528A) standard for detailed information on grazing systems.
2. **Native Hay Mulch With Viable Seed**
   a. Slope steep banks to not to exceed a slope of three horizontal to one vertical.
   b. Mulch the area with 2 to 3 tons per acre of native hay containing mature seed of desired grass species or bulrushes.
   c. Anchor hay mulch according to the method described Mulching (484) practice standard or by feeding livestock on the mulched area for a short period of time.
   d. Manage grazing to the extent necessary to maintain/improve the vegetative cover so it does not jeopardize the critical area planting.
3. **Feeding Hay on Critical Area**
   a. Seed a mixture of adapted native grass species/varieties at a minimum seeding rate of 30 PLS/sq. ft. in accordance with seed mixtures and rates shown in establishing grass cover for critical areas after November 1. Feed hay on the area according to standard Mulching (484). Feeding livestock hay should be discontinued by April 30 and so that the site is left in good condition for establishing grasses (no excessive clumps of hay, manure, etc.).
   b. In lieu of seeding, feed hay containing viable native grass seed per item 2 above.
   c. Manage grazing to the extent necessary to maintain/improve the vegetative cover so it does not jeopardize the critical area planting.

E. Temporary Stabilization of Critical Areas (for one growing season or less than 1 year's time).

1. **Cover Crops**
   a. Refer to Cover Crop 340 practice standard for selecting the appropriate cover crop for temporary stabilization of critical areas.
   b. Utilize the highest recommended cover crop seeding rate in standard Cover Crop (340) when establishing temporary cover on critical areas.
   c. The cover crop must be compatible for establishing the planned cover.

[1/] Table 1 – General Guide to Selecting Species for Specific Critical Areas Uses

Grasses or Legumes	Loams, Clay Loams, And Clays						Sand & Loamy Sand						Remarks
	1	2	3	4	5	6	1	2	3	4	5	6	
Native Grasses:													
Big bluestem	X	0	-	-	X	-	-	0	0	-	-	-	Can not tolerate close mowing
Buffalograss	0	-	-	X	0	X	0	-	-	0	0	0	Best adapted to close mowing
Blue grama	X	-	-	X	X	X	X	0	-	X	X	X	Adapted to periodic close mowing, mixtures only
Canada wildrye	0	X	X	-	X	0	-	0	0	-	0	-	Slightly wet areas, but grows on uplands, mixtures only
Green needlgrass	X	-	-	0	0	-	-	-	-	-	0	-	Northwestern Nebraska only on hard soils
Indiangrass	X	0	-	-	X	-	-	0	0	-	-	-	Can not tolerate close mowing
Little bluestem	X	-	-	0	X	0	X	-	-	0	X	0	Bunchgrass use in mixtures only
Prairie sandreed	-	-	-	-	-	-	X	X	0	-	X	-	Sandy areas
Prairie cordgrass	-	X	X	-	0	-	-	X	X	-	0	-	Wet areas
Sand bluestem	-	-	-	-	-	-	X	X	0	0	X	-	Can not tolerate close mowing
Sideoats grama	X	-	-	X	X	X	0	0	-	X	0	X	Emerges quickly, adapted to periodic mowing
Western wheatgrass	X	X	-	X	X	X	X	X	X	0	X	0	Cool Season grass adapted to wet/dry sites
Sand lovegrass	-	-	-	-	-	-	X	X	0	X	X	X	Bunchgrass use only in sandy mixture
Switchgrass	X	X	X	0	X	-	X	X	X	0	X	-	Cannot tolerate close mowing
Virginia wildrye	-	X	X	-	0	-	-	0	0	-	-	-	Best suited on wet areas/bottomlands, mixtures only
Introduced Grasses:													
Crested wheatgrass	-	-	-	X	-	X	-	-	-	X	-	X	Bunchgrass, use in mixtures in Western Nebr. only
Fairway wheatgrass	-	-	-	X	-	X	-	-	-	0	0	0	Bunchgrass, use in mixtures in Western Nebr. only
Intermediate wheatgrass	X	0	-	0	X	0	0	0	-	0	0	-	Short-lived in low rainfall areas
Smooth brome	X	0	-	0	X	0	X	0	-	0	X	-	Over 17" annual rainfall
Kentucky bluegrass	-	-	-	X	-	X	-	-	-	X	-	X	Irrigation needed/high maintenance
Perennial ryegrass	0	0	-	X	0	X	0	-	-	0	0	0	Short lived-use only in mixtures for quick cover
Tall fescue	X	0	-	X	X	X	-	-	-	0	0	0	Bunch grass use in mixtures in eastern Nebraska only
Pubescent wheatgrass	X	-	-	X	X	0	X	-	-	0	X	0	More drought resistant than intermediate
Creeping foxtail	-	X	X	-	0	-	-	-	0	-	-	-	Does best on wetter sites
Reed canarygrass	-	X	X	-	0	-	-	X	X	-	0	-	Wet areas, invasive in wetlands originally native
Forbs/Legumes:													Use forbs/legumes in mixtures only
Alfalfa	0	-	-	0	0	X	-	-	-	0	-	X	Select varieties that are long lived
Cicer milkvetch	-	-	-	0	0	0	0	-	-	-	0	-	
Purple prairieclover	0	-	-	X	X	X	0	-	-	X	X	X	Kaneb is improved variety
Red clover	-	-	-	X	0	X	0	-	0	X	X	-	Eastern Nebr. or favorable moisture sites in west
Roundhead lespedeza	0	-	-	-	X	0	0	-	-	-	X	-	
Thickspike gayfeather	0	-	-	-	X	X	0	-	-	-	-	-	Eastern Nebraska only
Dotted gayfeather	0	-	-	X	X	0	0	-	-	X	X	X	
Shell-leaf penstemon	0	-	-	0	X	0	0	-	-	0	X	X	
Maximillian sunflower	0	-	-	-	X	-	0	-	-	-	X	-	Aggressive keep seeding rate low best in east
Other forbs/legumes													Refer to Table 2 Pasture and Hayland Interpretations

Key: X = Best
0 = Fair
- = Poor or not suited

1 – Embankments Roads, Dam,
2 – Channels
3 - Shoreline and Low Areas

4 – Heavy Traffic and Recreation
5 – Roadside (not including embankments)
6 – Residential and Development Sites

[1/]Species must be adapted to vegetative zone/MLRA & soils/site refer to 550 Range Planting/512 Pasture Planting